

# TECHNICAL SPECIFICATIONS ISSUED FOR BID

## STORM DRAINAGE IMPROVEMENT WORKS

CANADIAN SPACE AGENCY, ST-HUBERT

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# **SECTION 4**

## **SPECIAL ADMINISTRATIVE CLAUSES**

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## 1.0 GENERALITY

For the purposes of this invitation to tender, tenderers must obtain the latest updated version of the standard specification NQ 1809-900 / 2018 (hereinafter called "NQ 1809-900". Unless otherwise stated, the articles of NQ 1809-900 / 2002 are an integral part of this tender document and must be followed in full with the details in this section. These documents are available in Quebec publications ([www.publicationsduquebec.gouv.qc.ca](http://www.publicationsduquebec.gouv.qc.ca)).

### 1.1 WORK DESCRIPTION (SCOPE)

The Canadian Space Agency (hereinafter referred to as the "Owner") wish to do a project of replacement and repair including:

- Project surveying;
- All safety measures on the work site;
- Excavation and profiling of ditches;
- Excavation and construction of the storm water pipes;
- The supply and installation of a shut-off valves;
- The construction of a catch basin;
- Foundation works for the settling pond;
- Sodding of the catch basin and the ditch;
- Management of contaminated materials (phragmite);
- Environmental measures and the management of cut / fill;
- Protection of existing services; aqueduct, gas and others;
- the transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.;
- Signaling and traffic management, including the use of alternative traffic lights or traffic signalers and site access management;
- Sweeping of parking lots as needed and at the request of the departmental representative with a mechanical vacuum broom.

The Contractor must provide all materials, labor and tools required for the installation of all the services described in the specifications, on the tender form and on the plans and profiles and include them in each unit price he will submit

### DESCRIPTION OF THE TENDER FORM:

#### 1.2 CATCH BASSIN

In the article entitled “**EXCAVATION AND CATCH BASSIN WORK ...**” the Contractor must include in the price per CUBIC METER, including but not limited to:

- a) The Contractor must provide the equipment and the appropriate work method for carrying out the excavation. He must take into consideration that the bottom of the basin has saturated soil and possibly unstable soils also.
- b) The excavation of the material and the existing foundation according to the transverse slopes requested;
- c) the implementation of the missing class “B” loan to reach the required levels of infrastructure;
- d) the transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.

All as specified in the plans and specifications.

In the article entitled “**ROCKFILLING**” the Contractor must include in the price per SQUARE METER, including but not limited to:

- a) Supplying and putting in place the stone 100 – 200 with a thickness of 300 mm;

All as specified in the plans and specifications.

In the article entitled “**NATIVE SPECIES SODDING**” the Contractor must include in the price per SQUARE METER, including but not limited to:

- a) Supply and installation of minimum 150 mm of topsoil according to the technical specifications;
- b) Applying fertilizers
- c) Removing all rubbish and all stones of 25 mm of diameter and more;
- d) The work necessary to make the materials compliant;
- e) Seeding of native species according to the slope of the site;
- f) Watering and protection of the lawn during the warranty period;
- g) General plant maintenance including replacement of damaged grass; and
- h) The re-grassing of portions of surfaces covered by less than 75% of shoots with a height of 150 mm.

All as specified in the plans and specifications.

In the article entitled “**MANAGEMENT OF SUSPENDED MATTER ...**”, the Contractor must include in the **global price**, including but not limited to:

- a) Application of administrative and technical clauses;
- b) Management of the suspended matter as specified in the technical specifications;
- c) Installation of the management system for the suspended matter during the work and before being discharge in the environment.

All as specified in the plans and specifications.

### 1.3 PHRAGMITE MANAGEMENT

In the article entitled “**CONSTRUCTION OF LOADING AREA ...**”, the Contractor must include in the global price, including but not limited to:

- a) The contractor must provide a loading and unloading area for materials containing phragmites;
- b) The contractor must provide an area where he can clean the vehicles before driving on the site;
- c) The loading area must be made of granular materials and must be enough big to protect the natural soil from the regrowth of phragmites.

All as specified in the plans and specifications

In the article entitled “**VEHICLE CLEANING ...**”, the Contractor must include in the global price, including but not limited to:

- a) The Contractor must avoid dispersing phragmites’ rhizomes between the loading and unloading areas, by cleaning of the machinery, e.g. (manual brushing or other technic approved by the technical experts before starting the work)
- b) The contractor must remove any phragmites’ rhizome on the transport vehicles;

All as specified in the plans and specifications

In the article entitled “**CONSTRUCTION OF A TEMPORARY ROAD ...**”, the Contractor must include in the price per square meter, including but not limited to:

- a) Excavation;
- b) Leveling of the ground and material until the requested level;
- c) The supply of labor, equipment and materials necessary for the installation of the
- d) geotextile;
- e) supply and installation of the various granular materials requested;
- f) Removing the material after the work is done;
- g) the transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.
- h) Repairing the damaged surface after removing the temporary road.

All as specified in the plans and specifications

In the article entitled “**TRANSPORT AND DISPOSAL OF PHRAGMITES ...**”, the Contractor must include in the price per square meter, including but not limited to:

- a) The contractor must provide the transport of the phragmites between the excavation site and the disposal site.
- b) The embankment of the earth containing the phragmites and the rhizome
- c) Leveling the soils and materials to the proposed level.

All as specified in the plans and specifications

In the article entitled “**COVERING OF MATERIALS CONTAINING ...**”, the Contractor must include in the global price, including but not limited to:

- a) The contractor must provide the transportation of the material class B between the excavation site and the disposal site.
- b) Installing approximately 1m of material on the embankment containing the phragmites and the rhizome
- c) Leveling the soils and materials to the proposed level.

All as specified in the plans and specifications

In the article entitled “**SODDING** “, the Contractor must include in the price per square meter, including but not limited to:

- a) Supply and installation of minimum 150 mm of topsoil according to the technical specifications;
- b) Applying fertilizers
- c) Removing all rubbish and all stones of 25 mm of diameter and more;
- d) The work necessary to make the materials compliant;
- e) Hydraulic seeding according to the slope;
- f) Watering and protection of the lawn during the warranty period;
- g) General plant maintenance including replacement of damaged grass; and
- h) The re-grassing of portions of surfaces covered by less than 75% of shoots with a height of 150 mm.

All as specified in the plans and specifications

#### 1.4 SEWER WORK

In the article entitled “**EXCAVATION AND PROFILING OF THE DITCH** “, the Contractor must include in the price per linear meter, including but not limited to:

- a) The contractor must carry out the excavation and backfilling work to create the ditches identified on the plans.
- b) The contractor must take into consideration the site constraints. For the ditch outside the site, along John Molson Street, the contractor must consider the narrow access roads. The contractor must provide the equipment and manpower required according to the accesses, width, etc. For the ditch on the agency site, the contractor must respect the work areas specified in the plans.
- c) Excavation according to the slopes and transverse requested;
- d) The implementation of the missing class “B” loan to reach the required levels of infrastructure;
- e) Levelling and compaction; and
- f) The transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.
- g) the repair of the surfaces damaged by the work like the path, the grass and other must be provided in the price of the bid

All as specified in the plans and specifications

In the article entitled “**EXCAVATION AND PROFILING OF THE WET LAND #1** “, the Contractor must include in the price per unit, including but not limited to:



- a) The contractor must take into consideration the site constraints
- b) Excavation according to the slopes and transverse requested;
- c) The implementation of the missing class “B” loan to reach the required levels of infrastructure;
- d) Levelling and compaction; and
- e) The transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.

All as specified in the plans and specifications

In the article entitled “**EXCAVATION AND PROFILING OF THE WET LAND #2 to #3**”, the Contractor must include in the price per unit, including but not limited to:

- f) The contractor must take into consideration the site constraints
- g) Excavation according to the slopes and transverse requested;
- h) The implementation of the missing class “B” loan to reach the required levels of infrastructure;
- i) Levelling and compaction; and
- j) The transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.

All as specified in the plans and specifications

In the article entitled “**NATIVE SPECIES SODDING**” the Contractor must include in the price per SQUARE METER, including but not limited to:

- c) Supply and installation of minimum 150 mm of topsoil according to the technical specifications;
- d) Applying fertilizers
- e) Removing all rubbish and all stones of 25 mm of diameter and more;
- f) The work necessary to make the materials compliant;
- g) Seeding of native species according to the slope of the site;
- h) Watering and protection of the lawn during the warranty period;
- i) General plant maintenance including replacement of damaged grass; and
- j) The re-grassing of portions of surfaces covered by less than 75% of shoots with a height of 150 mm.

All as specified in the plans and specifications.

## 1.5 SNOW DISPOSAL SITE

In the article entitled “**INFRASTRUCTURE PREPARATION AND SHAPING**” the Contractor must include in the **price per square meter** including but not limited to:

- a) Preparation and shaping of the infrastructure according to the slopes and transverse requested;
- b) The implementation of the missing class “B” loan to reach the required levels of infrastructure;

- c) Levelling and compaction; and
- d) The transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.

All as specified in the plans and specifications.

In the section entitled "**GEOMAMBRANE**", the Contractor must include in the **price per square meter**, including, but not limited to:

- a) Labor, equipment and materials necessary for the placement of the geotextile;
- b) Any loss of the geotextile for overlapping the work infrastructure. Meaning that the Contractor is paid per theoretical square meter of the area to be covered with the geotextile.

All as specified in the plans and specifications.

In the section entitled "**FOUNDATION ...**", the Contractor must include in the **price per square meter** according to the material and the thickness, but not limited to:

- a) Supplying and installing the different type of crushed stone;
- b) Leveling of the granular layer according to the proposed levels;
- c) the final leveling, etc.

All as specified in the plans and specifications.

In the article entitled "**INFRASTRUCTURE PREPARATION AND SHAPING OF THE DITCH AND THE SETTLING POUND**" the Contractor must include in the **unit price** including but not limited to:

- a) The work includes the construction of a settling pond. The contractor must profile the basin and provide the installation of the pipes and the valve.
- b) Preparation and shaping of the infrastructure according to the slopes and transverse requested;
- c) The implementation of the missing class "B" loan to reach the required levels of infrastructure;
- d) Levelling and compaction; and
- e) The transportation and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.

All as specified in the plans and specifications.

In the section entitled "**STORM WATER PIPE ...**", the Contractor must include at the price per linear meter, depending on the diameter, type of pipe and type of trench indicated, including but not limited to:

- a) Excavation of the trenches;
- b) Propping, trench support, water control, pumping, and protection of HQ poles near the work if required;
- c) The filling, backfilling, supply and placement of borrow material, when required;

- d) Supply and installation of the bedding, compaction;
- e) Supply and installation of the pipe with watertight joints;
- f) Compaction;
- g) Tees and plugs required including the connections to the pipes and the supply for sealing the joints;
- h) Strength tests;
- i) The transport and disposal of excess excavation and / or waste in a site authorized by the MELCC, etc.
- j) Removal of the existing pipes;

All as specified in the plans and specifications.

In the article entitled " **VALVE ...**", the Contractor must include in the **unit price**, including but not limited to:

- a) Excavation of 2nd class material;
- b) the transportation and disposal of excess excavation, existing valves to be replaced and / or discarded at an authorized site;
- c) Shoring, trench support, water control and pumping;
- d) support for surrounding structures;
- e) The preparation, supply, installation and compaction of the seat;
- f) cathodic protection;
- g) The supply and installation of the valve and the adjustable valve box, cover, extension, adjustment, fasteners, etc.;
- h) Connection of the valve box to the pipes including the pipe, the sleeves, the elbows, the tee, the stops, the retaining collar;
- i) backfilling and compaction;
- j) supplying and putting in place the borrow material, when required.

All as specified in the plans and specifications.

## 1.6 AUTRES

In the article entitled "**SITE ORGANIZATION**", the Contractor must include in the **global price**, but not limited to:

- a) The application of administrative clauses;
- b) Project surveying
- c) Coordination with subcontractors and various stakeholders;
- d) Detour roads, signage and other necessary measures;
- e) Temporary fences if necessary (installation and dismantling supply).

All as specified in the plans and specifications.

In the article entitled " **DEMOLITION AND RESTORATION OF PREMISES** ", the Contractor must include in the **global price**, but not limited to:

- a) Demolition of the existing site;

- b) The removal and replacement of elements affected by the work: signs, concrete base, decorative rock, bollards, fence, barrier, jersey, post, etc.;
- c) Provision and for the installation of a temporary fence if required;
- d) Environmental protection

All as specified in the plans and specifications.

In the article entitled " **SURFACE CLEANING AND REPAIRATION** ", the Contractor must include in the **global price**, but not limited to:

- a) The supply of machinery for cleaning and the disposal;
- b) The use of a vacuum vehicle with brooms for cleaning the paving surfaces;
- c) The cleaning;
- d) The disposal of waste in an authorized site;
- e) Sweeping at the request of the Departmental Representative.

All as specified in the plans and specifications.

# **SECTION 5**

## **GENERAL AND PARTICULAR TECHNICAL CLAUSES**

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## **1.0 Generality**

### **1.1 SPECIAL QUOTE**

The general and specific clauses take precedence over the clauses of the general conditions which they supplement. This special quote refers to the standard quote NQ 1809-900 (2018) NQ 1809-300 (2018) and to the general specifications and specifications (CCDG) of the MTQ (2020). These documents are an integral part of the tender documents and the contractors are required to obtain them.

These documents are available in Quebec publications ([www.publicationsduquebec.gouv.qc.ca](http://www.publicationsduquebec.gouv.qc.ca)).

### **1.2 MATERIALS**

Unless otherwise specified, the Contractor must use new materials only.

### **1.3 SITE ORGANISATION**

Section 10 "Site organization, site premises, traffic maintenance and signaling and environmental protection" of the CCDG (2020) is an integral part of this document and must be fully followed.

### **1.4 CLEANING**

The Contractor must, daily, clean the work site to the satisfaction of the Project Manager. Before the site is closed, the Contractor must collect and dispose of all debris and waste from the work at an authorized site.

## **2.0 WORKING METHOD**

During the work, the contractor must consider the following elements in relation to the site and the planned developments:

### **2.1 CATCH BASSIN**

The contractor must take into account the presence of phragmites in the catch basin. The proposed work method aims to prevent the spread of Phragmites on the site. The following photo represents the quantity of plants:





### 2.1.1 CATCH BASIN EXCAVATION

When excavating the basin, the contractor must take into account that the excavation must be in layers of +/- 300mm. The contractor will start the excavation on the side of the outlet and remove 300mm of material to the upstream of the basin. The contractor will then clean the machinery and start again on the side of the outfall. The goal of removing in 300mm layers is to reduce the risk of Phragmites contamination.

### 2.1.2 LOADING ZONE

The contractor must provide a loading and unloading zone for the material containing phragmites. The purpose of these zones is to locate the risks of contamination on the site.

### 2.1.3 CLEANING OF TRANSPORT VEHICLES

The contractor must clean the vehicles after the loading and unloading of the vehicle. Cleaning is required to prevent the spread of Phragmites rhizomes on the site.

### 2.1.4 TEMPORARY ROAD

The contractor must provide a temporary path to access the material drop-off site. The temporary path is required since the ground in place is not stable.



The contractor must remove the temporary road and the restoration of the premises.

### 2.1.5 COVERING MATERIALS

The contractor must embank the materials containing the phragmites. It is required that the soils containing the most rhizomes must be placed at the bottom of the projected embankment. The details are presented on the plans.

### 2.1.6 OTHER

In his working method, the contractor must take into consideration the specific clauses mentioned in the study of mitigation measures for the project provided in the appendix.

## 3.0 EXCAVATIONS AND BACKFILL

### 3.1 FILLING AROUND THE STRUCTURES

The Contractor must backfill around structures such as sumps, manholes, valve boxes, etc., using granular material such as MG-20b. The material must be laid on by layers of approximately 600 mm around the structure per layer of 300 mm maximum compacted to 90% of the modified Proctor, except in the portion corresponding to the foundations of streets or the material used as well as the compaction must meet the requirements of standard foundation and paving cuts.

### **3.2 SLOPE STABILITY AND EXCAVATION**

The contractor must take note of the environmental and geotechnical study for the stability of the excavation slope. The contractor must submit the plans signed and sealed by an engineer of his working method and shoring to achieve the slope stability requirements and the safety code for construction work S-2.1, r.4

### **3.3 LOSS OF VOLUME MASS AND SOIL REHABILITATION**

If the natural soil or a layer of a material, already compacted to the required density, undergoes, before the end of the work, a density loss due to the circulation of the equipment, to bad weather, to the action of frost- thaw or for any other reason, the Contractor must redo, at its expense, the compaction to the required density.

### **3.4 CONTAMINATED MATERIAL**

During excavation work, if the Client or his representative suspect the presence of contaminated material, The Contractor must temporarily suspend the work and must call the laboratory to carry out the tests necessary to determine the contamination present. The Contractor must dispose of the contaminated equipment in a location authorized by the Engineer on site and must cover the equipment with a waterproof membrane while awaiting the specifications of environmental specialists.

## **4.0 SEWER**

### **4.1 GENERALITY**

All the prescriptions of the general specification BNQ 1809-300 / 2018 "Construction work - general technical clauses - drinking water and sewer pipe" according to the most recent version, form an integral part of this tender document and must be fully followed with the clarifications in this section.

### **4.2 SPILL OF WASTEWATER INTO THE ENVIRONMENT**

No discharge of wastewater into the environment is permitted during the performance of the work. The Contractor must take all possible measures to prevent a spill.

### **4.3 DOMESTIC SEWER PIPES**

Domestic sewer pipes must be made of the same material, in accordance with the following specifications:

Domestic sewer lines must be made of unplasticized poly (vinyl chloride) (PVC-U) class DR 35 with seat and coating, in accordance with BNQ 3624-130 standards.

### **4.4 VALVE**

The valves of 200 mm in diameter must be direct flow valves with a resilient seat, in

accordance with the requirements of AWWA C550 or AWWA C509 standards, and they must have the characteristics described below:

- a) They must be made of cast iron, have a fixed rod in cast bronze, with double cover or in one piece. The disc must be made of cast iron, completely covered with urethane rubber;
- b) They must be fitted with a 50 mm square prescription cap with indication of opening to the left. They must bear on the hat or the body, cast directly on the coin, the inscription AWWA;
- c) The stem seals must be of the O-ring type; it must be possible to replace these seals when the valve is fully open and at full operating pressure;
- d) They must be waterproof and must function easily when subjected to a maximum operating pressure of 1375 kPa;
- e) The joints must be of the interlocking type (Tyton or equivalent) and have the same diameter as that of the corresponding pipe;
- f) They must be covered with fused epoxy both inside and outside in accordance with AWWA C550; and
- g) The bolts and nuts that join the parts of the valve must be made of stainless steel, class 304.

Tapping valves must be Model F-6100 by Clow or Model A-2360 by Mueller or the approved equivalent.

## **4.5 CATHODIC PROTECTION OF THE VALVES AND THE SET OF FIRE TERMINALS**

Valves, waterworks service entrances, and the set of fire hydrant sockets as well as all cast iron parts (elbows, tees, etc.) must be protected against corrosion by complying with the following requirements:

### **4.5.1 CHARACTERISTICS OF ZINC ANODES**

All prepackaged zinc anodes are of the Z-24-48 or Z-12-24 type in accordance with the following specifications:

- a) The cast zinc alloy complies with ASTM B-418-73 Type II according to the weights and lengths specified below.

<u>Type of anode</u>	<u>Weight of zinc</u>	<u>Length of zinc</u>
Z-24-48	10,9 kg	1220 mm
Z-12-24	5,4 kg	610 mm

- b) The zinc molding is contained in a cardboard tube having the following dimensions:

<u>Anode type</u>	<u>Tube diameter</u>	<u>Tube length</u>
Z-24-48	127 mm	1520 mm
Z-12-24 1	27 mm	760 mm

- c) The zinc molding inside the tube is surrounded by a selected filling, having an electrical resistivity of less than 45 ohm-cm wet, a compacted density of 1.5 g / cm<sup>3</sup> and the following composition:  
 Gypse 77 ± 2%      Bentonite 15 ± 1%      Sulfate de sodium 8 ± 1%
- d) All prepackaged zinc anodes are supplied with 3000 mm copper cable # 10/7, with orange TWH insulation.

#### 4.5.2 TYPE

The type of anode to be installed on the various equipment must meet the following requirements:

- a) Installation of a prepackaged zinc anode of the Z-12-24 type, on each valve, with a nominal diameter up to 300 mm, as well as on each water service inlet.
- b) Installation of a prepackaged zinc anode of type Z-24-48, on each set of fire hydrant sockets including its valve when the pipe connecting the terminal to the valve is made of cast iron.
- c) When the pipe connecting the fire hydrant to the valve is made of PVC-U, an anode must be installed on each valve according to the requirements described in point a) of this article and for the fire hydrant, it is necessary to install the type of anode Z-24-48 described in point b) of this article.

#### 4.5.3 INSTALLATION PROCEDURE

For the installation of the anodes, the Contractor must respect the following procedure:

- a) Place the anodes at the same depth as the pipe, parallel to the pipe and at a minimum distance of 300 mm from the pipe.
- b) Do not handle the anodes by their cable.
- c) Wind and tie the cable from the anode to the fitting to avoid any tension, either on the anode or on the connection to the fitting during backfilling and subsequent soil compaction.
- d) Connect the anodes to the fire hydrant assemblies and to the valves by the aluminothermic welding technique using the products manufactured by Erico Product (# CAB-133-M). Mechanical assembly (with a bolt) will not be allowed.
- e) Make all joints electrically continuous on ductile iron pipes, valves and fire hydrants, either using a key or copper strip specially designed to make the electrical connection.

- f) Clean and file an area of 50 mm x 50 mm on the surface of the pipe, until the white metal is exposed.
- g) Strip the end of the anode cable from its insulation, attach it to the metal surface prepared using the thermite welding technique. (N.B. Use Cadweld mold no CAHBA-1G, CA25 XF-19 cartridge and CAB-133-1L socket for the cable).

**Prepare the end of the cable to be soldered as follows:**

- Strip the cable to expose a length of 3.5 cm of copper conductor.
- Make sure the copper conductor is clean and dry.
- Crimp the CAB-133-1L socket on the copper conductor.

**Prepare the welding mold as follows:**

- Scrape the crucible to remove any clinker deposits.
- Insert the tin disk in the bottom of the crucible.
- Pour the contents of a cartridge into the crucible and make sure that there is no ignition powder left from the bottom of the cartridge.

**Solder the cable as follows:**

- Place the soldering mold on the prepared surface and insert the cable underneath.
  - Close the lid and ignite the charge using a gun with a flint.
  - Remove the soldering mold when the solder is a dull red color.
- h) After cooling, blow up the bottom clinker with the side of the file, check the weld by hitting it with a hammer and redo the weld if necessary.
  - i) If the weld is to be redone, a new weld must be made no closer than 15 cm from the original.
  - j) Seal the completed connection against moisture penetration using a good application of "Tapecoat" or "Primer" # 937 sealant.

## **5.0 FOUNDATION**

### **5.1 GENERAL CONDITION**

The requirements contained in these clauses apply to all foundation and paving work. The Contractor is required to comply with them as well as with all those of the specific technical clauses and other documents which form an integral part of the contract.

### **5.2 SCOPE OF WORK**

Foundation and paving work include the labor, materials, machinery and tools necessary for the execution of foundation and paving work. They also include the transport and supply of any necessary material as well as the cleaning of the premises, the removal of unusable



materials, the installation of crushed stone, the preparation of the surface and the seal coating, as well than all other work necessary for the proper execution of the work in accordance with the plans and specifications.

### **5.3 AGGREGATES AND ASPHALT**

The granular materials and the bituminous concrete used for the pavement structure must meet the requirements of the CCDG of the MTQ, the most recent edition for this type of use. The aggregates will be new.

### **5.4 FOUNDATION**

#### **5.4.1 PUTTING IN PLACE AND COMPACTION OF THE FOUNDATION**

The materials will be leveled to obtain the profile shown on the plans.

The Contractor must ensure that the materials do not undergo segregation and, if necessary, must scarify and moisten them in order to meet the requirements of compaction.

The foundation will be compacted with the appropriate equipment so as to obtain a compactness of at least 95% of the Modified Proctor.

The finished surface must be uniform, free from depression and conform to the determined profile and crown. All places unreachable to the roller must be mechanically pounded in order to obtain a compaction equal to that of the rest of the foundation.

The finished surface must not have any depression greater than 10 mm within 2 m of the prescribed profile.

The Contractor must take into account the weather conditions so that no foundations are left under bad weather. According to the above, unstable or saturated surfaces must be repaired at the Contractor's expense.

#### **5.4.2 CRUSHED STONE**

The crushed stone must meet the criteria of BNQ 2560-114 in its most recent update and with the related sections relating to the registered standard.

#### **5.4.3 CHANGES OF ALIGNMENTS OR PROFILES**

The Engineer reserves the right to make changes to the alignments or on the profiles shown on the plans. When the Contractor is notified of such a change, he must comply with it without delaying the work.

#### **5.4.4 INFRASTRUCTURE STABILITY**

The Tenderer must tender with the express agreement that he must take all the necessary

precautions in the preparation of the infrastructure so that his paving is permanently supported and he will not be relieved of the responsibility imposed on him by this clause because " soil of lower quality or that trenches and tunnels would have been made prior to the date of receipt of tenders at or near the paving to be built.

## **5.5 COMPACTION**

The compactness required is 95% or more from the reference maximum dry density obtained in the modified Proctor test. The Project Manager may authorize that the maximum reference density be established from a compaction test bed carried out on site and at a water content close to the optimum compaction value. In the latter case, the degree of compactness required will be 98% of the reference value obtained by the test board. A new test board must be made each time there are variations in the nature or composition of the materials sprayed.

## **6.0 EXISTING SIGNS**

The Contractor is responsible for removing, moving and reinstalling existing signage. The cost of this work is included in its unit price for "Site organization"

## **7.0 MAINTENANCE AND REPAIR BEFORE FINAL ACCEPTANCE OF WORK**

During the warranty period, the Contractor will carry out all repairs deemed necessary by the Engineer. If he does not comply with the requisitions of the Engineer on this subject, the latter, after having notified the Contractor in writing to perform the said work within the following four (4) days, will take the necessary measures to have these works carried out. repairs at the Contractor's expense and expense.

## **8.0 SODDING**

### **8.1 GENERAL**

All the prescriptions of the general specification NQ 0605-100 "Landscaping using plants" form an integral part of this tender document and must be fully followed with the details of this section.

The maintenance of grassed surfaces must be done during 15 calendar days (watering, cutting, etc.) from the date of the end of installation date.

### **8.2 SITE EXAMINATION**

Notify the Client in writing of any situation he notices on the site, before or during the work, which could affect the work in this section. Stop work until the situation has been inspected and corrected. The beginning or the continuation of the works implies that the Contractor cannot make any claim which may result from any situation which he has thus accepted.

Notify the Contracting Authority in writing when the work is completed.



### **8.3 INSPECTION**

The inspection for acceptance of this work takes place within forty (40) days after the notice has been sent.

### **8.4 PLANT LAND TESTS**

The topsoil supplied by the Contractor must be analyzed at the Contractor's expense by a specialized laboratory and accepted by the Contracting Authority before the start of the work. The laboratory must provide the results of the analyzes, in writing, whether or not compliant.

The topsoil must be composed of a homogeneous mixture corresponding to silty sand and meeting the physical and chemical requirements of standard NQ 0605-100.

## **9.0 RÉFECTION DES LIEUX**

### **9.1 GENERAL**

All the prescriptions of the general specification NQ 0605-100 "Landscaping using plants", of chapter 13 "Asphalt pavement" of the CCDG and BNQ 1809-500 "Sidewalks and curbs" are an integral part of this document and must be followed in full with the details in this section.

### **9.2 SCOPE OF WORK**

All places (grass, hedge, tree, shrub, curb, sidewalk, post, paving, etc.) damaged by the Contractor during the work must be repaired by the latter, to the satisfaction of the engineer. After repairing the curbs and sidewalks, the Contractor must put in place, behind them, class "B" equipment accepted by the Contracting Authority if no lawn exists. For all sections of lawn that will have been affected, the Contractor must install sod and 150 mm thick topsoil to restore the affected areas to their original state. During this filling at the back of the curbs, the Contractor must adjust the water service box.

After all the granular foundation, paving and sidewalk work, the Contractor must ensure that the catch basin, manholes and sewers are properly cleaned (sanitary, rain, combined). The Contractor must include these costs within the articles of the bid schedule.

### **9.3 PRIVATE ENTRY REPAIR**

The repair of private entrances is carried out over the entire right of way, and this, over the full width of the entrance. All damage caused outside this surface is subject to the prescriptions of the previous article.

It is possible that the repairs to the private entrance extend over a larger area than that affected by the work (in order to properly reshape the entrances). The Contractor must therefore plan the removal and disposal of existing paving and/or concrete when this situation arises.

Private entrances can be concrete, bituminous concrete, decorative concrete paving while including concrete or wooden edges and walls, hedges, shrubs and fences, etc.

## 9.4 RECOVERY OF PREMISES

The contractor must provide for the restoration of the premises affected by the work without limitation; he must provide for the following repairs;

### Turf

1. The repair works are as indicated on the plans, i.e., the restoration of the surfaces currently in turf;
2. Repair work on private land must be carried out to the most distant place damaged by the work or to the place indicated by the Project Manager when land reprofile work is necessary following the change of geometry;
3. 150 mm of topsoil must be provided and installed before laying the sod.

### Hydraulic seeding

- The seeding work must be carried out in the places where the ditch was repaired. The surface of agricultural land must be covered with 150 mm of topsoil (ideally the same pickling soil as before the work). All other surfaces that are not sodded must be seeded to the most distant place, damaged by the work or to the place indicated by the engineer when ground reprofile work is necessary following the change of geometry;
- 150 mm of topsoil must be supplied and installed before the hydraulic seeding operation; and
- Repair work on land other than that specified in a) must be carried out on all the part damaged by the work or because of the work.

### Hedges, shrubs, trees

- Adequate removal and storage;
- Digging where hedges, shrubs and trees are to be replaced;
- Adding topsoil;
- The required fertilizer;
- Replacement of broken plants.

### Borders, sidewalks

- The removal and off-site disposal of the part damaged or removed during the work;
- Reconstruction of new curbs and sidewalks including expansion joints.

### Crushed stone entrance and paving

- Removal and off-site disposal of existing paving;
- Reconstruction of the granular foundation according to the types and thicknesses specified;
- The laying of a layer of paving, according to the thickness specified on the plans

### Fence, barrier, etc.

- Dismantling of fence barriers, bollards, jersey
- Storage and protection during works and;
- Replacement at the end of the work

## 10.0 SPECIFIC TECHNICAL ENVIRONMENTAL CLAUSES

### 10.1 PROTECTION OF THE ENVIRONMENT

Throughout the duration of the contract, the contractor must ensure that all persons under his responsibility take all necessary measures to protect the environment. More specifically, he must:

- Ensure that there will be no storage of materials, no circulation of machinery, no digging of trenches or any other unauthorized intervention that could damage or modify lakes and watercourses with regular or intermittent flow, their banks and their respective flood plains or adjacent or isolated wetlands (ponds, marshes, swamps or peat bogs);
- Respect all the easements shown on the plans and take the necessary measures to prevent the machinery from circulating outside the easements that have been assigned to it. In no event shall the Contractor be authorized to negotiate additional easements on the lakes and watercourses, their respective shores and floodplains or in the adjacent or isolated wetlands;
- Preserve on the site all vegetation such as trees, shrubs and other herbaceous plants (including grassy areas) that do not interfere with the work. If the contractor damages the vegetation outside the planned easement, he must replace it at his expense, unless the restoration is included in the work (see section "Conservation of trees");
- Proceed as soon as possible and as the work progresses to restore disturbed areas (e.g., stabilization and revegetation of slopes and bare soils). Vegetation of disturbed soils should be done with native species preferably. The restoration elements must ensure that the environment will be equivalent or improved compared to the situation prior to the intervention;
- Make sure not to throw, spill or allow to escape onto the ground or into waterways organic or inorganic materials or petroleum products and their derivatives (antifreeze or solvent). An intervention kit for the recovery of hazardous materials must be present on the site. Any spill of contaminants must be the subject of immediate response measures to confine, recover and dispose of the products in accordance with the Environment Quality Act (EQA) and the policies and regulations of the Minister du Sustainable Development, Environment and the Fight against Climate Change (MELCC) in the manner approved by the engineer. In all cases of spills, Urgence-Environnement must be notified immediately at 1-866-694-5454, in accordance with section 21 of the LQE;
- Maintain machinery (oil change, etc.) at a minimum distance of 30 m from a lake, stream or wetland (ponds, marshes, swamps or peat bogs). The machinery must be cleaned to remove excess oil or grease before starting shore work, and it must also be inspected regularly for leaks. Biodegradable hydraulic fluids are recommended for work in these sensitive environments or near them;
- Clean the machinery before arriving at the work site to remove the mud, plant fragments and animals attached to it;

- Do not use pesticides (herbicides, fungicides, insecticides, etc.), unless you have obtained appropriate authorization from the regional directorate of the MELCC.
- Take all the necessary measures and build all the necessary facilities and use the appropriate mitigation measures to avoid contamination of lakes and streams with new, used or excavated materials found on the site;
- When there is pumping of the water found at the bottom of an excavation or work area, pumping water can be discharged directly into the watercourse if it does not contain suspended solids beyond the background noise and visible to the naked eye. Otherwise, the contractor must provide a system to avoid the suction of sediment and discharge water into an infiltration area, outside the shore of any lake or watercourse. However, if the amount of water pumped is too large for it to fully infiltrate the soil before it reaches the water body, then the water must be pumped into a sedimentation tank. The sedimentation basin must be set up outside the shoreline of the lake, watercourse or wetland (pond, marsh, swamp or bog). The water discharged at the outlet of the sedimentation tank must not contain suspended matter beyond the background noise and visible to the naked eye;
- Use recognized control methods to avoid or control the production of dust and smoke and any atmospheric pollution on the work site. The dust suppressants used must comply

## **10.2 MANAGEMENT OF EXCAVATION AND BACKFILL MATERIALS**

Throughout the duration of the contract, the contractor must ensure that any person under his responsibility takes all the measures necessary to adequately dispose of excavation and backfill materials. More specifically, he must:

- Ensure that all excavated materials that are not reused, including in particular sawn timber, rubble and plaster, concrete and masonry pieces as well as pieces of paving, are managed (by treatment, recovery or disposal) in accordance with Environment Quality Act, Regulation respecting the burial and incineration of residual materials and the Regulation respecting hazardous materials. If necessary, the contractor must himself find the place of disposal and submit it to the approval of the engineer;
- Ensure that all excavation and backfill materials are managed in accordance with the interim grid for the management of excavated contaminated soil presented in the Policy for the protection of soil and the remediation of contaminated land, the Regulation respecting the burial of contaminated soil and the Regulation respecting the storage and transfer centers of contaminated soil;
- Ensure that excavation materials are available outside lakes and watercourses with regular or intermittent flow, their respective shores, flood plains and wetlands;

Provide the engineer with written proof that the materials from the site have been deposited in an authorized location.

## **10.3 DISPOSAL OF EXCAVATION SURPLUSES**

All of the cuttings storage and disposal sites (excavation surplus excluding any waste) envisaged for the realization of this contract must be approved beforehand by the engineer, at the latest at the first site meeting. No disposal of these materials can be made without obtaining this approval.

All excess excavation disposal sites will be subject to adequate leveling and revegetation to the satisfaction of the Consultant.

Excavation surpluses must be placed outside the aquatic environment as defined above and including any wetland, any shore, any coastline, any flood plain as well as the bed of any body of water.

## 10.4 EROSION CONTROL DURING WORK

Tableau 1 – TABLE OF EROSION CONTROL DURING WORK

Practices	Description
1. Isolate the site	<ul style="list-style-type: none"> <li>• Install sediment barriers.</li> </ul>
2. Define work and material storage areas	<ul style="list-style-type: none"> <li>• Provide areas reserved for storage and protect them adequately (tarpaulin or mulch);</li> <li>• Do not store materials on an area of vegetation to be preserved.</li> <li>• Do not store materials less than 30 m from the high-water mark of a watercourse with a permanent flow and provide sediment barriers (10 m in the case of a watercourse with an intermittent flow);</li> <li>• Delineate the circulation surfaces of the machinery and protect them.</li> </ul>
3. Plan the drainage of work surfaces 4. aiming to reduce erosion	<ul style="list-style-type: none"> <li>• Divert water runoff from areas adjacent to the construction site and prevent them from passing through work surfaces;</li> <li>• Provide for the treatment of runoff water on the construction site.</li> </ul>
5. Limit deforestation and the removal 6. plant cover	<ul style="list-style-type: none"> <li>• Delineate and conserve wooded areas;</li> <li>• Respect the municipal regulations that apply to the banks of watercourses;</li> </ul>
7. Protect bare ground and slopes	<ul style="list-style-type: none"> <li>• Use different methods depending on the slopes of the terrain, the surface to be protected and the required duration of protection.</li> </ul>
8. Plant vegetation as quickly as possible in open area	<ul style="list-style-type: none"> <li>• Apply temporary measures if planting cannot be done quickly (compost, mulch, products with mattresses);</li> <li>• Consider slopes when choosing methods.</li> </ul>

## 10.5 TREES CONSERVATION

The Contractor is held responsible for any damage caused to the trees to be preserved located on all the sites of the contract and must replace each damaged tree either by a tree of the same essence and of the same dimension, or by a tree of the same essence of 150 mm diameter and eight meters in height, and must guarantee its survival for a period of two years after acceptance of the contract.

The trees to be protected must also have a protected area around them, with a radius of five meters.

In the event that this minimum surface cannot be respected, the following technique must be applied which minimizes soil compaction, the effects of which are harmful to the health of trees: it involves spreading over the surface used, a non-woven geotextile membrane and place a 20 cm high earth cushion on it.

When there is an accidental nick of part of the root system, which is observed only during the execution of the work, an equal portion of branches must be pruned by a specialist.

A specialist must see the pruning and the necessary care during the works. The specialist's contact details must appear on the list of subcontractors.

## **10.6 GROUND QUALITY**

Considering the effective mitigation measures, the contractor must take into consideration the following clauses:

- Before starting the work, the contractor must present to the supervisor the approaches and methods that he intends to implement to comply with the mitigation measures and environmental requirements.
- Provide for the establishment and application of an emergency plan in the event of an accidental spill of contaminants. Clearly identify the persons and authorities responsible as well as the procedure to follow in the event of an environmental emergency. Ensure that the response plan contains, at a minimum, a response plan and an alert structure that are known to all employees.
- Carry out an inspection of equipment and machinery before their introduction to the site and, in the event of a leak, immediately repair or exclude the machinery from the site.
- Maintain equipment in perfect working order. Check daily for the presence of contaminants leaking on the equipment, which must be repaired immediately if necessary.
- Perform general maintenance and fueling of machinery at locations identified by the site supervisor.
- Only keep on site the quantities of hazardous materials required to carry out the work, if required.
- Provide well-identified sealed containers intended to receive petroleum products, if necessary.
- Place containers containing hydrocarbons and other dangerous products in a bin or between berms with the capacity to collect 110% of the stored reserves.
- Use storage tanks for petroleum products that comply, depending on their type of use, with the laws and regulations in force.
- Execute, under constant supervision, all handling of fuel, oil, other petroleum products or contaminants including the transfer in order to avoid accidental spills and to react promptly, if necessary.

- Ensure that an oil recovery kit is available at each work site and that each kit contains absorbent materials and all the equipment necessary to intervene in the event of a spill.
- In the event of a spill, apply the emergency plan, notify ECCC and the MELCC, use protective and containment measures (absorbent berms, for example), quickly clean the area (if possible). Urgence Environnement Québec (1-866-694-5454) must be informed of any accident that could disrupt the environment, as must ECCC's National Center for Environmental Emergencies (1-866-283-2333). Telephone numbers should be posted in a visible location on the site.
- Store any potentially contaminated material on an impermeable surface and cover it so as to avoid erosion by the wind or surface runoff of particles.
- Manage the soil in accordance with the regulations in force on the site. Commercial zoning allows reuse of soils with contamination below CCME guidelines - commercial use on site.
- If soil showing signs of contamination (stain, odor, presence of debris, etc.) is encountered during excavation work, stop the work and immediately notify the site supervisor. In the presence of soils, sediments and surface or underground water contaminated beyond the criteria applicable to the site, these must be stored properly and/or managed in a site authorized to receive them under the applicable regulations, in particular the Intervention guide – PSRTC of the MELCC and the Regulation respecting the storage and transfer centers of contaminated soils.
- Hazardous residual materials must be disposed of at a duly authorized site. Ensure that there is no risk of loss of contaminated materials when transporting them off site.
- Keep the site free of waste or store it temporarily in sealed containers intended for such purpose.
- Any residual materials produced during the work must be picked up and disposed of according to their nature. The contractor must ensure that no debris is left on the work site.
- Recover or recycle residual materials when possible or transport them off site and dispose of them according to the regulations in force. Waste managed off-site must be transported to a place authorized by the MELCC.
- Confining the circulation of heavy machinery on preferred routes within the intervention zone.
- Stabilize the soil in all areas of the site where there is a risk of erosion.
- Avoid compacting the natural soil or causing it to harden.
- Avoid creating ruts.
- Restore vegetation on compacted areas to improve infiltration properties.



- Quickly restore worksite areas.
- The contractor must remove from the site all residual materials, hazardous residual materials, temporary installations, tools, equipment, machinery and materials found on the site in order to leave it perfectly clean.

## 10.7 WATER QUALITY

Considering the effective mitigation measures, the contractor must take into consideration the following clauses:

- Refuel and maintenance of construction machinery and vehicles on a site designated for this purpose, located at least 20 m from the water retention basin.
- Park machinery and vehicles at least 20 m from the water retention basin.
- Avoid carrying out excavation work during heavy rains in order to prevent the dispersion of water laden with sediment towards the drainage ditches or the retention basin.
- If necessary to prevent the migration of water laden with sediment or other contaminants towards drainage or water retention structures, use sediment barriers, sediment traps for sumps, etc. in accordance with the manufacturer's recommendations.
- No water containing suspended solids beyond the applicable criteria must be discharged, pumped, directed or otherwise conveyed to the drainage network, the rainwater network or the sanitary network.
- Avoid leaving floors bare and exposed to atmospheric elements.
- Avoid any modification to the drainage that is not provided for in the project.
- No debris should be thrown into drainage ditches or basins; in the event of an accidental release of debris, recover it quickly and dispose of it at an authorized site.
- Quickly restore the worksite areas, including seeding, if necessary.
- During the operation phase of water drainage, retention and decantation works, ensure adequate maintenance to avoid accumulations of water in unplanned places, soil erosion and transport of debris or quantities significant amounts of suspended matter outside the property. If necessary, clean the structures, reseed it, clear weeds, pick up debris, etc.

## 10.8 AIR QUALITY

Considering the effective mitigation measures, the contractor must take into consideration the following clauses:

- Ensure that the vehicles and equipment used are maintained in perfect working order (e.g., exhaust system).
- Turn off the engines of construction machinery not in use as soon as possible.
- Stabilize heavy traffic areas with clean gravel or other suitable protective material and limit the speed of vehicles to avoid raising dust.
- If necessary, use a dust suppressant accepted by the MELCC (water or product that complies with the BNQ 2410-300 standard).
- Avoid preparing a site or carrying out work on it during periods of strong winds or prolonged drought in order to protect it from wind erosion.
- Stabilize soil in piles, stored construction materials and debris to prevent them from being blown away.
- Cover and contain fine particles during transport to, on and off site.

## 10.9 TERRESTRIAL VEGETATION

Considering the effective mitigation measures, the contractor must take into consideration the following clauses:

- In order to prevent a new introduction and spread of invasive plant species on CSA property, machinery must be cleaned before arriving on site to remove any material that could increase the risk of spreading invasive plant species (plant fragment, seed, etc.).
- In order to prevent the spread of invasive species on CSA property, machinery (excavators, bulldozers, mower/mower, etc.) must be cleaned when leaving areas affected by the presence of IAS (mainly the common reed) so as to be cleared of any material that could increase the risk of spreading invasive plant species (plant fragments, seeds, etc.).
- In order to prevent the spread of invasive species on CSA property, spoil transport equipment (truck or other) must be cleaned when leaving the areas affected by the presence of IAS so as to be free of any material that may increase the risk of spreading invasive plant species (plant fragment, seed, etc.), if they appear contaminated with such materials.
- Avoid carrying out work during heavy rain or when the ground is wet, which increases the risk of soiling the equipment and makes it difficult to clean equipment that may contain EEE.
- Delineate the work areas and ensure that no work is carried out outside them.
- Minimize removal of topsoil.

- Stabilize the soil in all areas of the site where there is a risk of erosion.
- Preserve existing trees and shrubs.
- In the company of the supervisor, identify, before the work, the trees and shrubs likely to be damaged during the work and take the necessary measures to protect them.
- Branches at risk of damage should be pruned.
- If deforestation work is necessary, make sure to inventory the vegetation colonizing the work areas to avoid cutting or affecting special-status species.
- Avoid moving, dumping or storing materials on living vegetation.
- Avoid circulating on foot or using machinery, do not backfill and do not store anything inside the drip line of trees.
- Redevelop the areas altered by the works in order to promote the natural recovery of vegetation.
- During the operation phase of the structures, maintain herbaceous plants to prevent the return of the common reed, for example, by mowing them regularly at the spoil management site.
- During the operation phase of the works, carry out the maintenance of the sown areas requiring mowing.

## **10.10 WORK PERIOD**

The work must be carried out during periods of low water and during periods of low rainfall. Measures to avoid any input of fine materials (earth, sand, clay, organic matter, etc.) into the watercourse must be implemented without delay over the entire area of the site until the full re-vegetation;

The work must be carried out as soon as possible according to working hours.

## **10.11 WORK AREA ISOLATION MEASURES**

When temporary isolation measures are needed in the work area, the method proposed by the Contractor must respect the following principles:

- Only clean stone and rough gravel without clay or silt can be used. The impermeability of the structure is ensured by a waterproof membrane;
- The water pumped from the trench must be carried out according to the standards established in this specification;

- At all times, the residual flow section must be equal or greater than half the cross section of the river along the axis of the trench and the flow velocity must always be less than 0.9 m/s.

During the work period, for small river with a flow of less than 250 l/s, the authorization to stop completely the flow using a single dike may, in certain cases, be granted. In addition, a pump must evacuate the flow downstream of the work sector. This method offers the advantage of only requiring the placement of a single dike since the pump discharge pipe can be placed far enough downstream to prevent backflow into the trench.

As for the temporary diversion of a river, in addition to being illegal in the majority of cases, experience has shown that this technique is very disruptive and deserves to be purely and simply rejected.

The Contractor shall install a filter curtain to surround the work area downstream of the river channeling the work area to prevent the dispersion of sediments. In addition, when doing a job on the river and the riparian strip, the Contractor must also install a filter curtain, insofar as this work involves the suspension of sediments.

## **10.12 PROTECTIVE WORKS**

Throughout the work period, the environmental protection works must be maintained and kept in good condition by the mandated contractor. Damaged or buried devices should be replaced or cleaned as needed. Sedimentation ponds should be emptied regularly.

At the end of the work, the sediment accumulated at the foot of the membranes, sediment barrier and straw bale must be removed manually before removing these facilities.

At all times, the removed sediments must be deposited outside the shoreline and the shore of any watercourse, lake or wetland.

## **10.13 MITIGATION MEASURE**

During the execution of the contract, the Contractor is required to comply with the directives of the Consultant and the MELCC regarding all mitigation measures necessary for the protection of the environment. The contractor is required to carry out the work in accordance with these requirements.

## **10.14 WORK DELIMITATION**

The work area should be delimited so that the machinery does not circulate outside the authorized work area.

## **10.15 ACCES ROAD**

Access roads and all bare soil must be revegetated upon completion of the work.

## **10.16 STABILIZATION (SEEDING AND PLANTING) AND SITE REHABILITATION**

At the end of each working day, soil protection methods (sediment barriers, covering membranes) must be installed on any bare surface vulnerable to erosion and likely to produce sediment flowing towards any course. of water, lake, ditch flowing into a body of water or any wetland.

## 10.17 RESTORATION MEASURE

The restoration of disturbed sites must be done as the work progresses. Restoration elements must ensure that the affected environment will be equivalent or improved compared to the situation prior to the intervention.

- For interventions in wetlands, the final layout must ensure that the drainage conditions and the quality of the substrate are not modified.

The slopes must be restored following the slope of the natural slope or by redeveloping a stable slope, depending in particular on the nature of the soil, the length of the slope and the hydrology of the watercourse. However, the rearranged slope should not be steeper than 1:2, i.e., 1 m "vertical" for 2 m "horizontal", which is equivalent to a slope of 27° or 50%. Herbaceous seeding will be done as the work progresses, according to the procedures described on the following pages.

Herbaceous regeneration techniques are applied as soon as work is completed on the shore, with the exception of the winter period. In winter, a geotextile must be installed on the surfaces stripped by the work. The geotextile must be fixed to the ground using stakes according to the engineer's specifications. The geotextile will prevent the spread of sediment in the watercourse.

## 10.18 HYDRAULIC SEEDING

Hydroseeding may also be used, but using the method described below, to provide instant protection against surface erosion.

### 10.18.1 ANTIÉROSION MATTRESS

Anchored to the ground by wooden or metal stakes (peat stakes), at the rate of two stakes per square meter.

The anti-erosion mattress must be made of a vegetable type and contain no synthetic element. The types of mattresses offered are as follows:

#### Antierosion mattress to control erosion

Slope	Naturel mattress	Longevity
3H :1V	Straw 1F of Texel or equiv.	≤ 12 months
2H : 1V	Straw 2F of Texel or equiv.	≤ 12 months
	Wood ST-0.73 1F of Texel or equiv.	≤ 18 months
1.5H :1V	Straw-Coc 2F of Texel or equiv.	≤ 24 months
1H : 1V	Woven Coco 400 of Texel or equiv.	≤ 36 months
	Coco 2F of Texel or equiv.	≤ 36 months

### 10.18.2 SEEDLING

#### Mixture Herbio native stabilization (or equivalent):

French name	Latin name	Percentage in the mixture
Fétuque rouge traçante	Festuca rubra	55%
Pâturin des marais	Poa palustris	17%
Élyme du Canada	Elymus canadensis	10%
Élyme de Virginie	Elymus virginicus	10%
Agrostide scabre	Agrostis scabra	8%
Total at the rate of 1,5 kg/100 m2		100%

When the riparian strip sector is considered critical with high potential for the environment, the contractor must use the following mix:

#### Indigo Seed mix native stabilization (or equivalent):

French name	Latin name	Percentage in the mixture
Barbon de Gérard	Andropogon gerardii	10%
Avoine	Avena sativa	10%
Deschampsie cespiteuse	Deschampsia cespitosa	10%
Panic clandestin	Dichanthelium clandestinum (Panicum clandestinum)	4%
Élyme du Canada	Elymus canadensis	10%
Fétuque rouge	Festuca rubra	25%
Ivraie multiflore	Lolium multiflorum	5%
Panic raide	Panicum virgatum	10%
Pâturin des prés	Poa pratensis	14.5%
Herbes à liens	Spartina pectinata	1.5%
Total à raison de 2,0 kg/100 m2		100%

Equivalents will be accepted if only the contractor demonstrates that 100% of the plants are native and are suitable for the environment.

### 10.18.3 HYDRAULIC MULCH

- Oat, barley, alfalfa or wheat straw containing minimal weed seeds. Its mass is calculated from a moisture content of less than 15%. The minimum amount of straw required is 70%;
- Cellulose fiber free from germination and growth which paralyzes the ingredients. The cellulose fiber forms a kind of blotter allowing the slow absorption and filtration of water. The maximum acceptable amount of cellulose fiber is 20%.

Mulch is spread at the rate of 40 kg/100m2

Fixative, organic, degradable, land tack type at the rate of 1kg/100 m2

#### Execution

- Extend and anchor the photodegradable net;
- Sow the mixture: seedlings, mulch and fixative well tangled beforehand.

## 10.19 HYDRAULIC SEEDING FOR CATCH BASIN

### 10.19.1 ANTIÉROSION MATRESS

Anchored to the ground by a wooden or metal stakes (peat stakes), at the rate of two stakes per square meter.

The anti-erosion mattress must be made of a vegetable type and contain no synthetic element. The types of mattresses offered are as follows:

#### Antierosion mattress to control erosion

Slope	Naturel mattress	Longevity
3H :1V	Straw 1F of Texel or equiv.	≤ 12 months
2H : 1V	Straw 2F of Texel or equiv.	≤ 12 months
	WoodST-0.73 1F of Texel or equiv.	≤ 18 months
1.5H :1V	Straw-Coc 2F of Texel or equiv.	≤ 24 months
1H : 1V	Wooden Coco 400 of Texel or equiv.	≤ 36 months
	Coco 2F of Texel or equiv.	≤ 36 months

### 10.19.2 SEEDLING

Previously used seedlings

### 10.19.3 HYDRAULIC MULCH

- Oat, barley, alfalfa or wheat straw containing minimal weed seeds. Its mass is calculated from a moisture content of less than 15%. The minimum amount of straw required is 70%;
- Cellulose fiber free from germination and growth which paralyzes the ingredients. The cellulose fiber forms a kind of blotter allowing the slow absorption and filtration of water. The maximum acceptable amount of cellulose fiber is 20%.

Mulch is spread at the rate of 80 kg/100m<sup>2</sup>

Fixative, organic, degradable, land tack type at the rate of 1kg/100 m<sup>2</sup>

#### Execution

- Extend and anchor the photodegradable net;
- Sow the mixture: seedlings, mulch and fixative well tangled beforehand.

## **10.20 REGENERATION ON A NON-SANDY SLOPE**

In Quebec, there are a few steep slope banks that support shrubby and arboreal vegetation. These sites were created gradually through the expansion of firmly planted shrubs and sheltered from other vegetation. After the sanitation works, on such slopes, young seedlings can be transplanted, but these will have to consolidate their roots before spreading and being able to effectively counter erosion. The soil on these steep slopes will therefore have the possibility in the meantime of tumbling down at the slightest bad weather, which will have the effect of gradually uncovering the roots of the new plants.

The gabion wall, a palliative in these situations, cannot go behind a Shrub thicket, like a riprap, because its verticality prevents the accumulation of deposits between the stones. It can, however, be hidden behind a curtain of vines, which will turn green each spring.

When the slope is steep and long, it is sometimes possible to raise a wall of gabions halfway up the slope. The ground is covered with herbaceous plants on the section overhanging the wall while a row of vines runs along the wall to veil it. Finally, red osier dogwoods with long-leaved spirea are planted among the herbaceous plants and through the biodegradable netting.

## **10.21 Regeneration on medium slope**

In the case of a medium slope whose soil is not "sensitive" sand or clay, it is necessary to build a riprap up to the highwater level. Rows of broad-leaved spirea and red osier dogwood should then be transplanted to the top of the riprap. The ground will have previously been covered with herbaceous plants according to the methods described above.

In summary, it would be preferable, when the drainage works carried out on banks with a steep or medium slope cannot be moved, to reduce the inclination to 1:2 (1 m vertically for 2 m horizontally). This operation cannot, under any circumstances, be carried out by encroaching on the bed of the river, even during low water periods. In addition, drawdown should be achieved by removing material from the top of the slope towards the land rather than from the land towards the river. As for the herbaceous and shrubby regeneration of a low slope, this is done according to the nature of the soil.

## **10.22 Regeneration on low slope**

On a low slope made up of sand, otherwise acceptable species, such as green alder and willow, cannot be retained. In fact, the roots of these species continually seek water and tend to seep into the sewers, thus disrupting the flow of wastewater. Red osier dogwood and white rose are therefore the only ones used in this case. However, for all other types of soil, dogwood, combined with mountain ash spirea in the portion: ½, is perfectly suitable.



# **SECTION 6**

**Mitigation measures form for basic projects**